

2 PHYSICAL EXAMINATION & CLASSIFICATION OF FIRED BULLET EVIDENCE	Page 1 of 5
Division of Forensic Science FIREARM/TOOLMARK PROCEDURES MANUAL	Amendment Designator: A
	Effective Date: 19-December-2003
<div data-bbox="331 348 1370 378" data-label="Section-Header"> <h2>2 PHYSICAL EXAMINATION & CLASSIFICATION OF FIRED BULLET EVIDENCE</h2> </div> <div data-bbox="151 411 393 438" data-label="Section-Header"> <h3>2.1 Introduction</h3> </div> <div data-bbox="245 472 1511 562" data-label="Text"> <p>The initial examination of any fired bullet evidence will include the completion of a worksheet. These worksheets will include the physical and damage description and/or a drawing or photocopy or photograph of the fired evidence, which will serve as a source to document the condition of the evidence as received and any tests or comparisons performed.</p> </div> <div data-bbox="151 594 496 621" data-label="Section-Header"> <h3>2.2 Safety Considerations</h3> </div> <div data-bbox="245 655 1471 745" data-label="Text"> <p>Examinations performed in the Firearm and Toolmark Section are inherently hazardous. These procedures involve hazardous chemicals, firearms, ammunition, and power tools. All hazardous procedures must be performed in compliance with the DFS Safety Manual.</p> </div> <div data-bbox="151 777 634 804" data-label="Section-Header"> <h3>2.3 Preparation of Cleaning Solutions</h3> </div> <div data-bbox="245 837 1156 865" data-label="Text"> <p>NOTE: ALWAYS ADD ACID TO WATER. NEVER ADD WATER TO ACID.</p> </div> <div data-bbox="245 898 568 926" data-label="Section-Header"> <h4>2.3.1 Acetic Acid Solution</h4> </div> <div data-bbox="342 959 1505 1085" data-label="List-Group"> <ul style="list-style-type: none"> • Prepare a 15% Acetic Acid Solution by adding 150 milliliters of Glacial Acetic Acid to 850 milliliters of distilled water • Store solution in an appropriate, sealed container that is marked with the date and initials of the preparer • Record in the Firearms Quality Record Book </div> <div data-bbox="245 1117 521 1144" data-label="Section-Header"> <h4>2.3.2 Bleach Solution</h4> </div> <div data-bbox="342 1178 1502 1274" data-label="List-Group"> <ul style="list-style-type: none"> • Prepare a Bleach Solution by combining 10 milliliters of bleach to 90 milliliters of distilled water • Store solution in an appropriate, sealed container that is marked with the date and initials of the preparer • Record in the Firearms Quality Record Book </div> <div data-bbox="151 1306 435 1333" data-label="Section-Header"> <h3>2.4 Instrumentation</h3> </div> <div data-bbox="245 1367 574 1526" data-label="List-Group"> <ul style="list-style-type: none"> • Comparison Microscope • Stereo Microscope • Caliper/Micrometer/Ruler • Scale/Balance • Ammunition references </div> <div data-bbox="151 1558 763 1587" data-label="Section-Header"> <h3>2.5 Minimum Analytical Standards and Controls</h3> </div> <div data-bbox="245 1619 380 1648" data-label="Text"> <p>Appendix A</p> </div> <div data-bbox="151 1680 513 1709" data-label="Section-Header"> <h3>2.6 Procedures or Analysis</h3> </div> <div data-bbox="245 1743 1481 1801" data-label="Text"> <p>The evidence will be marked in accordance with the Quality Manual. A systematic approach should be used for the physical examination and classification of fired evidence, with recording of findings and observations in notes.</p> </div>	

2 PHYSICAL EXAMINATION & CLASSIFICATION OF FIRED BULLET EVIDENCE	Page 2 of 5
Division of Forensic Science FIREARM/TOOLMARK PROCEDURES MANUAL	Amendment Designator: A
	Effective Date: 19-December-2003
<div data-bbox="248 348 883 378" data-label="Section-Header"> <p>2.6.1 General, Visual, Physical, and Trace Examinations</p> </div> <div data-bbox="342 411 1539 501" data-label="Text"> <p>The initial examination of any bullet will include a bullet worksheet. This worksheet will serve as a source to document the condition of the bullet as received. Further information will be added to the worksheet as tests are performed.</p> </div> <div data-bbox="342 533 1539 623" data-label="Text"> <p>Examine the bullet visually and microscopically for any trace material. Determine if further examination of material is necessary and consult the appropriate section prior to the removal of any trace evidence. Document findings and observations and record in notes.</p> </div> <div data-bbox="342 655 1539 714" data-label="Text"> <p>Once the bullet has been examined for the presence of pertinent material, visual and physical examinations are conducted to determine the following bullet features, to be documented on the worksheet:</p> </div> <div data-bbox="342 745 1539 1329" data-label="List-Group"> <ul style="list-style-type: none"> • Any material present • Caliber/gauge • Bullet/slug weight (record weight of bullets in grains; record weight of slugs in ounces or grains) • Number of land and groove impressions on a fired bullet • Direction of twist • Measured width of the land impressions • Measured width of the groove impressions • Measured diameter • Bullet composition • Bullet style • Possible manufacturer/marketer of the bullet/projectile • Description of the base of the bullet • Type and position of cannelures • Any extraneous markings to include flared base, skid marks, shave marks, and other marks • Presence of gunpowder and/or powder imprints adhering to the base • Condition of the fired evidence as received • Suitability of the fired evidence for comparison purposes • As appropriate, compare marks on bullets with tests from a firearm or with other bullets (see Section 5) </div> <div data-bbox="248 1360 643 1390" data-label="Section-Header"> <p>2.6.2 Trace Material Examination</p> </div> <div data-bbox="342 1421 1539 1572" data-label="Text"> <p>Evidence recovered during an investigation may contain trace material transferred from the crime scene. This trace material may be in the form of blood, tissue, plaster, paint, hairs, fibers, glass, etc. The examiner needs to evaluate the importance of this evidence, and if further examination of the material is necessary, remove and preserve a sample of the material present. Removal of the material may also be necessary to allow the proper examination of the evidence.</p> </div> <div data-bbox="342 1604 1539 1732" data-label="List-Group"> <ul style="list-style-type: none"> • Remove material being careful not to damage the evidence • Place the removed material in a suitable container/packaging for possible submission to the appropriate section for further examination • Record findings and observations in the notes </div> <div data-bbox="342 1761 1422 1791" data-label="Text"> <p>If the trace material IS NOT going to be retained for further examination, proceed with the following:</p> </div> <div data-bbox="342 1822 1539 1950" data-label="List-Group"> <ul style="list-style-type: none"> • For evidence containing blood, tissue, or other biohazards, soak or sonicate the evidence for at least one (1) minute in a Bleach Solution (refer to 2.3) • Remove loosened material by rinsing with methanol or water • Remove plaster by soaking in a 15% Acetic Acid Solution (refer to 2.3) </div>	

2 PHYSICAL EXAMINATION & CLASSIFICATION OF FIRED BULLET EVIDENCE

Page 3 of 5

Division of Forensic Science FIREARM/TOOLMARK PROCEDURES MANUAL

Amendment Designator: A

Effective Date: 19-December-2003

- Remove paint by soaking in alcohol or acetone
- Use a non-abrasive brush to remove loose material
- Use Naval Jelly™ or E-zest™ coin cleaner to removed dark stains as needed
- Record findings and observations in examiner's notes

2.6.3 Caliber Determination

Caliber, or the base diameter, is one of the class characteristics of a fired bullet, and is written as a numerical term that may be depicted with or without a decimal point. The determination of caliber will aid the examiner during the identification or elimination of a suspect firearm. If no firearm is submitted, the bullet's caliber may be used in determining the General Rifling Characteristics of the firearm involved. The following may be utilized to determine the caliber of any fired bullet. The condition of the bullet will determine which steps can be used:

- Compare the base diameter of the evidence bullet directly with known fired test standards
- Measure the base diameter of the evidence bullet using a measuring device and compare this measurement with known measurements published in reference literature
- Determine the number and widths of the land and groove impressions and compare to Appendix G, Table 6, of the AFTE Glossary, 3rd Edition
- Physical characteristics of the evidence bullet, such as weight, bullet shape, composition, nose configuration, and number and placement of cannellures, may aid in caliber determination

2.6.4 Methods of Measuring Lands and Grooves

One of the class characteristics used in the discipline of firearm identification is the width of the land impressions and groove impressions. These measurements may aid the examiner during the identification or elimination of a suspect firearm. If no firearm is submitted, these measurements will be used in determining the General Rifling Characteristics of the firearm involved. The measuring of land and groove impressions on a fired bullet can be accomplished by utilizing either the air-gap method or one of the stereo microscope methods (grid, micrometer, caliper, or ruler).

In measuring a fired bullet to determine the width of the land impression or the groove impression, it is paramount that the points used for beginning and ending a measurement comply with the discipline-wide practice. This practice utilizes the anchor points shown below.



It may be necessary to measure several of the suitable land and groove impressions in order to obtain a reliable measurement.

2 PHYSICAL EXAMINATION & CLASSIFICATION OF FIRED BULLET EVIDENCE	Page 4 of 5
Division of Forensic Science FIREARM/TOOLMARK PROCEDURES MANUAL	Amendment Designator: A
	Effective Date: 19-December-2003
<p>At a minimum, one land impression measurement and one groove impression measurement, recorded to the nearest hundredth or thousandth of an inch should be recorded in the notes for each bullet. For multiple bullets previously identified as having been fired from the same firearm, only one bullet needs to be measured. Methods may include the air gap method, the stereo microscope-micrometer/caliper method, stereo microscope – grid method, or stereo microscope – ruler method.</p> <p>2.6.4.1 In the air gap method the fired bullet in question is mounted on one stage of the comparison microscope. The measuring device is mounted on the other stage. Both stages must be using the same magnification level (objective setting) and be in focus.</p> <p>Align the image of the land or groove impression with one of the anchor points corresponding with the anvil of the micrometer or measuring jaw of the caliper. Rotate the micrometer’s spindle to the next anchor point of the micrometer or the other jaw of the caliper to the land or groove impression and record the measurement gap (opening) of the micrometer/caliper to the nearest hundredth or thousandth of an inch.</p> <p>2.6.4.2 In the stereo microscope-micrometer/caliper method the fired bullet in question is either held or mounted on a steady surface beneath the stereo microscope.</p> <p>Align the image of the land or groove impression with one of the anchor points corresponding with the anvil of the micrometer or measuring jaw of the caliper. Rotate the micrometer’s spindle to the next anchor point of the micrometer or the other jaw of the caliper to the land or groove impression and record the measurement gap (opening) of the micrometer/caliper to the nearest hundredth or thousandth of an inch.</p> <p>2.6.4.3 In the stereo microscope–grid method the fired bullet in question is either held or mounted on a steady surface beneath the stereo microscope.</p> <p>The land or groove impression of the fired bullet is positioned with both of the anchor points corresponding to points on the alignment grid. The measurement is recorded to the nearest hundredth or thousandth of an inch.</p> <p>2.6.4.4 In the stereo microscope – ruler method the fired bullet in question is either held or mounted on a steady surface beneath the stereo microscope.</p> <p>The land or groove impression at the base of the fired bullet is placed perpendicular to the scale of the ruler. The distance between both anchor points of a land or groove impression are measured and recorded to the nearest hundredth of an inch.</p> <p>2.6.5 FBI General Rifling Characteristics File (GRC)</p> <p>The FBI’s General Rifling Characteristics File (GRC) can be utilized when attempting to determine a list of possible firearms that could have fired an evidence bullet when no firearm is submitted. The GRC specifications can be accessed using various software utilities or the printed reference file. The GRC File is an investigative aid and should not be construed as an all-inclusive list of firearms available with those particular class characteristics.</p>	

2 PHYSICAL EXAMINATION & CLASSIFICATION OF FIRED BULLET EVIDENCE	Page 5 of 5
Division of Forensic Science FIREARM/TOOLMARK PROCEDURES MANUAL	Amendment Designator: A
	Effective Date: 19-December-2003
<div data-bbox="248 348 600 378" data-label="Section-Header"> <p>2.6.6 Interpretation of Results</p> </div> <div data-bbox="345 411 1549 663" data-label="List-Group"> <ul style="list-style-type: none"> • Caliber is written as a numerical term and may be depicted with or without the decimal point. If the base is mutilated, the examiner may only be able to determine that the evidence is consistent with a range of calibers or that the caliber cannot be determined. • May determine caliber/gauge, brand, type, style, general rifling characteristics of the fired bullet • May determine if there are suitable markings for identification with a firearm or with other fired components • May determine list of possible firearms that could have fired the bullet • May be able to identify the firearm in which it was fired • Record interpretation of results in examiner's notes </div> <div data-bbox="151 695 527 726" data-label="Section-Header"> <p>2.7 Appropriate Appendices</p> </div> <div data-bbox="248 756 631 787" data-label="Text"> <p>Appendix A - Calibration Standards</p> </div> <div data-bbox="248 816 542 846" data-label="Text"> <p>Appendix C - Work Sheets</p> </div> <div data-bbox="151 877 371 907" data-label="Section-Header"> <p>2.8 References</p> </div> <div data-bbox="248 938 1023 968" data-label="Text"> <p>Association of Firearm and Toolmark Examiners Glossary, 3rd ed. 1994.</p> </div> <div data-bbox="248 999 1023 1029" data-label="Text"> <p>Association of Firearm and Toolmark Examiners Glossary, 4th ed. 2001.</p> </div> <div data-bbox="248 1060 846 1089" data-label="Text"> <p>Barnes, Frank C. <u>Cartridges of the World</u>. 9th ed, 2000.</p> </div> <div data-bbox="248 1121 1234 1152" data-label="Text"> <p>Howe, Walter, J. "Laboratory Work Sheets". <u>AFTE Newsletter</u>. No. 2, August 1969, p. 13.</p> </div> <div data-bbox="248 1180 1414 1243" data-label="Text"> <p>Lutz, Monty C. and Ward, John G. "Determination of Bullet Caliber From an X-ray," <u>AFTE Journal</u>, Vol. 21, No. 2, p. 168.</p> </div> <div data-bbox="248 1270 872 1302" data-label="Text"> <p>Mathews, J. Howard. <u>Firearms Identification Vol. I</u>, 1973.</p> </div> <div data-bbox="248 1333 1451 1365" data-label="Text"> <p>Molnar, S. "A Simplified Technique for L&G Measurements". <u>AFTE Newsletter</u>, No. 4, December 1969, p. 28.</p> </div> <div data-bbox="248 1394 1383 1455" data-label="Text"> <p>U.S. Department of Justice. Federal Bureau of Investigation. NCIC. <u>Criminalistics Laboratory Information System (CLIS) Operating Manual</u>. 2001 - 2002.</p> </div> <div data-bbox="248 1484 1446 1516" data-label="Text"> <p>Walsh, J. F. "Accuracy, Speed and Conversion in Rifling Measurements". <u>AFTE Journal</u>. Vol. 9, No. 1, p. 50.</p> </div> <div data-bbox="248 1545 394 1577" data-label="Text"> <p>www.afte.org</p> </div> <div data-bbox="248 1608 474 1635" data-label="Text"> <p>www.firearmsid.com</p> </div> <div data-bbox="1466 1671 1549 1698" data-label="Text"> <p>◆ End</p> </div>	